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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/659,006	09/09/2003	Christopher H. Bajorek	004085.P030X	3505

7590 08/08/2007

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EXAMINER	
DANIELS, MATTHEW J	
ART UNIT	**PAPER NUMBER**
1732	

MAIL DATE	DELIVERY MODE
08/08/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/659,006	BAJOREK, CHRISTOPHER H.	
	Examiner	Art Unit	
	Matthew J. Daniels	1732	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 May 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16 and 18-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-16 and 18-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *5/14/07*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 14 May 2007 has been entered.

Information Disclosure Statement

2. The information disclosure statement filed 14 May 2007 fails to comply with 37 CFR 1.98(a)(2), which requires a legible copy of each cited foreign patent document; each non-patent literature publication or that portion which caused it to be listed; and all other information or that portion which caused it to be listed. It has been placed in the application file, but the WO 9801890 patent has not been considered because no copy was included.

Claim Rejections - 35 USC § 112

3. Rejections set forth previously are withdrawn.

Claim Rejections - 35 USC § 102

4. Rejections set forth previously under this section are withdrawn in favor of the following rejections under 35 USC 103(a).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. **Claims 1, 2, 8, 11, 12, and 22** rejected under 35 U.S.C. 103(a) as obvious over Davis (2002/0025408). **As to Claim 1**, anticipation of the claim depends on the interpretation of the claimed "before there is any substantial cooling of the resist film". Davis teaches a method comprising:

heating a stamper and a resist film ([0073] and [0074]);

imprinting the stamper into the resist film ([0076]);

separating the stamper from the resist film ([0076]);

cooling the resist film after separating (inherent in that other operations are subsequently performed).

Davis does not explicitly teach "separating the stamper from the resist film before there is any substantial cooling of the resist film". However, this limitation would have been prima facie obvious over Davis' teachings regarding the mold and resist temperatures.

Regarding the mold, Davis teaches that the mold temperature can be above the glass transition temperature of the material to be embossed ([0073], lines 8-10), preferably within 30C above the glass transition temperature ([0073], lines 10-13), and most preferably within about 10C above the glass transition temperature ([0073]), line 14. Furthermore, by *maintaining* the

mold slightly above the glass transition temperature and separately heating the substrate to greater than the glass transition temperature, the embossing cycle time can be reduced by orders of magnitude ([0078]).

Regarding the resist, Davis teaches that the substrate is heated to a temperature between about 5C or less above the glass transition temperature for crystalline material, and greater than about 5C above the glass transition temperature for amorphous materials ([0073]). Furthermore, Davis teaches that the substrate can be *maintained* or changed as necessary to enable substrate release ([0075], lines 3-7).

Because the mold is maintained within about 10C above the glass transition temperature and the resist is at a temperature substantially similar to the glass transition temperature (5C or less above the Tg if crystalline, more than 5C above the Tg if amorphous, [0074]), there would not be any substantial cooling of the resist film before separation. Additionally, Davis teaches that the particular temperatures of both the mold and resist represent result-effective variables that should be optimized in order to (1) optimize replication, (2) enable substrate release from the mold, and (3) maintain the integrity of the surface features. Thus, the temperatures of both mold and resist represent result effective variables that should be optimized. See MPEP 2144.05 II and *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). **As to Claim 2**, see [0073], [0077], [0074], [0078]. **As to Claim 8**, see [0077]. **As to Claims 11 and 12**, see [0073] and [0074]. **As to Claim 22**, see [0053]).

6. **Claims 3-6** are rejected under 35 U.S.C. 103(a) as being unpatentable over Davis (2002/0025408) in view of Chou (USPN 5956216). Davis teaches the subject matter of Claims 1

and 17 above under under 35 USC 103(a). **As to Claim 3**, Davis appears to be silent to the trenches and plateau areas, but Chou teaches trenches and plateaus (Fig. 8). It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of Chou into that of Davis a) in order to provide a magnetic material adapted for horizontal recording (4:54-64), and b) in order to to provide a plurality of discrete elements of magnetic material, and c) because Davis clearly suggests the magnetic materials and method which Chou provides (Davis, par. [0080]). **As to Claim 4**, Chou teaches a substrate (Item 40, Figs. 4A-4D). **As to Claims 5 and 6**, Chou teaches selectively removing the resist film to form a pattern of areas that do not have the resist film thereon (Fig. 4C), and disposing a magnetic layer in the areas that do not have the resist film (Fig. 4D, Item 48).

7. **Claim 10** is rejected under 35 U.S.C. 103(a) as being unpatentable over Davis (2002/0025408). Davis teaches the subject matter of Claim 1 above under 35 USC 103(a). **As to Claim 10**, Davis appears to teach that the mold is maintained at its temperature, and thus would appear to be heated first. See [0078] in particular. However, the claimed order of heating represents a rearrangement in the order of steps, which is generally considered to be prima facie obvious in the absence of unexpected results. Here, it would have been prima facie obvious to rearrange the order of steps in order to perform a procuring temperature on the resist ([0066]-[0070]) and to subsequently imprint the preheated resist.

8. **Claim 7** is rejected under 35 U.S.C. 103(a) as being unpatentable over Davis (2002/0025408) in view of Chou (USPN 5956216), and further in view of Chou (USPN

6309580). Davis and Chou ('216) teach the subject matter of Claim 5 above under 35 USC 103(a). **As to Claim 7**, Davis and Chou ('216) appear to be silent to the deliberate etching of the base structure using the patterned resist film. However, Chou ('580) teaches that recesses may be formed in the substrate (Fig. 8 and 10:41-51) using a patterned resist film produced by imprinting (Figs. 1A-1D). It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of Chou ('580) into that of Davis because Davis suggests application of material into the spaces between the resist, and because doing so would mechanically secure the deposited material into the substrate, rather than to the surface.

9. **Claim 9** is rejected under 35 U.S.C. 103(a) as being unpatentable over Davis (2002/0025408) in view Faircloth (J. Vac. Sci. Technol. B, Vol. 18, Num. 4, Jul/Aug 2000). Davis teaches the subject matter of Claim 1 above under 35 USC 103(a). **As to Claim 9,** Davis appears to be silent to the multilayer resist. However, Faircloth teaches that bilayer resists are conventional in nanoimprint lithography (see the entire document). It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of Faircloth into that of Davis because single layer resists are known to be problematic, and because doing so would provide higher resolution arrays of particles, lines, and crosshatches (Faircloth, right column).

10. **Claims 13-16** are rejected under 35 U.S.C. 103(a) as being unpatentable over Davis (2002/0025408). Davis teaches the subject matter of Claim 12 above under 35 USC 103(a). **As**

to Claim 13, Davis does not explicitly teach the "close proximity", however, it would have been prima facie obvious to keep the stamper in close proximity to the resist film in order to avoid heat loss during transfer. **As to Claim 14**, Davis appears to be silent to the exact temperatures. However, firstly Davis clearly recognizes that the particular temperatures of the stamper and resist represent result effective variables that the ordinary artisan would have optimized ([0073] and [0074]). See MPEP 2144.05 II and *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). Additionally, Davis suggests that the substrate (and resist) be heated to about 5 C above the glass transition temperature, and that the stamper should be within about 30 C over the glass transition temperature ([0073] and [0075]). **As to Claim 15**, Davis clearly teaches the resist and mold both be heated to a temperature very close to or at the glass transition temperature. **As to Claim 16**, Davis also teaches an embodiment wherein the resist is at a temperature slightly above the glass transition temperature, and the stamper is slightly below the temperature of the resist ([0073] and [0075]).

11. **Claim 21** is rejected under 35 U.S.C. 103(a) as being unpatentable over Davis (2002/0025408) in view Faircloth (J. Vac. Sci. Technol. B, Vol. 18, Num. 4, Jul/Aug 2000). **As to Claim 21**, Davis teaches a method comprising:

heating a stamper and a resist film to a first temperature at least that of a transition temperature of the resist film ([0073] and [0074]);

imprinting the stamper into the resist film ([0076]);

cooling the resist film to a second temperature above room temperature ([0076] and [0078]);

separating the stamper from the resist film ([0076]).

Davis teaches that the particular temperatures of both the mold and resist represent result-effective variables that should be optimized in order to (1) optimize replication, (2) enable substrate release from the mold, and (3) maintain the integrity of the surface features. Thus, the temperatures of both mold and resist represent result effective variables that should be optimized. See MPEP 2144.05 II and *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). In particular, Davis teaches that this could be accomplished by cooling the resist to any temperature below the glass transition temperature (which would be above room temperature), meeting the claimed temperature limitations.

Davis appears to be silent to the multilayer resist. However, Faircloth teaches that bilayer resists are conventional in nanoimprint lithography (see the entire document). It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of Faircloth into that of Davis for the following reasons:

(1) Davis provides a basic imprinting process and Faircloth provides a bilayer resist, and one of ordinary skill in the art could have combined the elements as claimed by known methods, namely substitution of the layer of Davis with the bilayer of Faircloth, wherein each element would have performed the same function as it did separately (both methods are imprint processes) to achieve the predictable result of varying the resist properties.

(2) The method of Davis provides a base imprinting process, Faircloth provides a known technique applicable to an imprinting process, namely the use of multilayered resists, and one of ordinary skill in the art would have found it obvious to apply the technique of Faircloth to that of Davis to provide the predictable results of (1) providing higher resolution arrays of particles,

lines, and crosshatches, (2) layers having distinct characteristics, such as different etching characteristics (Faircloth, page 3, right column) or compression characteristics (Fig. 4).

(3) Davis suggests vapor deposition of metals ([0080]) and other magnetic materials onto the formed surface of the polymer material and teaches that embossed bit patterns must have a depth of about 10 to 150 nm in order to be accurately recognized by the head devices ([0072]). Faircloth provides a bilayer resist which enhances the ability to descum the bottom of the trenches (page 3, right column), increasing the depth of the imprint and removing of the mold release agent (page 3).

(4) Davis suggests the imprinted layer may include polyacrylates and PMMA ([0054]), which Faircloth provides (page 2).

12. **Claims 18 and 19** are rejected under 35 U.S.C. 103(a) as being unpatentable over Davis (2002/0025408) in view Faircloth (J. Vac. Sci. Technol. B, Vol. 18, Num. 4, Jul/Aug 2000), and further in view of Chou (USPN 5956216). Davis and Faircloth teach the subject matter of Claim 21 above under 35 USC 103(a). **As to Claim 18**, Davis appears to be silent to disposing the resist film above a base structure prior to heating, the base structure comprising a substrate. However, Chou teaches a substrate (Item 40, Figs. 4A-4D). It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of Chou into that of Davis because Davis clearly suggests a variety of coatings ([0064] and [0067]). **As to Claim 19**, Davis appears to be silent to the claimed limitations. However, Chou teaches selectively etching the resist film to form areas above the base that do not have the resist film thereon (Fig. 4C) and disposing a magnetic layer above the base layer in the areas that do

not have the resist film (Fig. 4D). It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of Chou into that of Davis because Davis clearly suggests the method for magnetic media ([0052]).

13. **Claims 23 and 24** are rejected under 35 U.S.C. 103(a) as being unpatentable over Davis (2002/0025408) in view of Chou (USPN 5956216), Chou (USPN 6309580), and Chen (USPN 4786564). Davis, Chou ('216), and Chou ('580) teach the subject matter of Claim 7 above under 35 USC 103(a). **As to Claim 23**, Chou ('580) teaches removing the resist film (10:3-24) wherein a pattern of raised zones and recessed zones is formed in the base structure, but Davis, Chou ('216) and Chou ('580) appear to be silent to a continuous layer. However, Chen teaches a continuous layer which is provided as protection for the underlying alloy (7:67-8:7). It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of Chen into that of Davis in order to provide a hard layer to protect the delicate magnetic structure. **As to Claim 24**, Davis teaches a thermoset resist ([0053]).

Response to Amendment

14. The declaration under 37 CFR 1.132 filed 14 May 2007 is insufficient to overcome the rejection of claim 1 based upon the Davis reference as set forth in the last Office action.

The declaration provides opinion evidence that the integrity of the surface features of the molded substrate can be affected by different steps in the molding operation, and that surface feature integrity is affected by other parameters such as temperature before embossing, temperature and pressure at initial contact, and applied pressure during compressing.

However, the first sentence of Par. [0075] recites that the once the substrate has reached its desired temperature, it is placed in the mold and pressure is applied. The second sentence of Par. [0075] recites that after placement of the substrate in the mold (including the step of providing the substrate at the desired temperature), temperature adjustment and optimization is further performed to enable removal of the mold from the substrate. In view of the extensive discussion of preheating the mold and substrate found in Pars. [0073] and [0074], it is submitted that the second and third sentences of Par. [0075] pertain to the temperature of the mold during the molding process, and not to preheating. The word "Typically" in the third sentence of Par. [0075] indicates that it is one alternative process for achieving the results recited in the preceding sentence.

Response to Arguments

15. Applicant's arguments filed 14 May 2007 have been fully considered but they are not persuasive. The arguments appear to be on the following grounds:

a) Applicants disagree with the interpretation of the second sentence of Par. [0075] of the Davis reference. The teachings that the temperature can be maintained after the substrate is placed in the mold and still maintain the integrity of the surface features does not, ipso facto, apply to the removal operation.

b) As supported by the declaration of David Treves, one would understand the third sentence of Par. [0075] to refer to a mandatory next step, and the mold is always cooled below its glass transition temperature before removal.

c) There is no motivation for the combination of Faircloth with Davis and hindsight analysis has been used. There is no specific problem that would be addressed by Faircloth. Davis does not disclose transferring patterns using metal liftoff, and therefore one would not be motivated to look to the liftoff teachings of Faircloth.

16. These arguments are not persuasive for the following reasons:

a,b) The Examiner maintains the interpretation of the reference set forth previously. The Applicants' position appears to be that the second and third sentences of Par. [0075] should be viewed separately. However, the second sentence suggests a result, and the third sentence suggests a method in which the result may typically be achieved. However, other methods are not foreclosed by the second sentence of that paragraph, wherein it is disclosed that the temperature can be maintained, increased, or decreased as necessary. No unexpected results have been asserted which would distinguish the claimed process from the optimized process of Davis. Even if Applicants' interpretation were found to be correct with regard to the required or mandatory of the third sentence of Par. [0075], there appears to be no dispute that steps of heating, imprinting, separating, and cooling are disclosed by the reference, and it is generally prima facie obvious to rearrange process steps in the absence of unexpected results.

c) In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge

generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

With regard to the Applicants' arguments against the stated motivation, it is noted that the arguments are drawn to one of three rationale. Additionally, Davis recognizes that shallow depths are problematic because of the reduced ability to recognize the data contained on the surface. Faircloth provides a method which would improve the depth and aspect ratio of the imprinted features, and also a cleaning step to remove mold release agents, which would thereby improve recognition of features.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J. Daniels whose telephone number is (571) 272-2450. The examiner can normally be reached on Monday - Friday, 8:00 am - 4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Christina Johnson can be reached on (571) 272-1176. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

MJD 8/3/07

MJD

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